

Intravenous Sedation in Clinical Dental Practice

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Sedation is becoming increasingly popular among dental practitioners all over the world. It is because training to perform sedation, equipment necessary for sedation and the time for recovery following sedation are much less than with general anaesthesia.

Sedation: Sedation is a technique where one or more drugs are used to depress the central nervous system of a patient thus reducing the awareness of the patient to his surroundings. This enables treatment to be carried out. Sedation may be conscious sedation or deep sedation. In conscious sedation the patient maintains rational response to command and protective reflexes, throughout the period of sedation. This is the type of sedation that is carried out in dentistry. In contrast in deep sedation the patient may at times be conscious and at other times unconscious drifting from one state to the other. Patients who have had deep sedation should be treated in the same manner as those who had general anaesthesia because of the

possibility of the patient being unconscious at any time.

Objectives: The main objective of sedation is to enable patients to tolerate dental procedures. Sedation is aimed to reduce or abolish patients anxiety or fear of the procedure and provide relaxation of the patient, thereby some relaxation of the part in which the procedure is to be carried out. The drugs used should also preferably provide a degree of amnesia of the procedure. Sedation is also aimed at reducing movements of the patient. The method should maintain consciousness of the patient and thereby the protective reflexes, maintain vital signs and maintain the cooperation of the patient. It should provide early ambulation compared to general anaesthesia. The above advantages experienced by the patients intend to provide the patient confidence for subsequent visits. With these benefits provided to the patient it is intended to reduce the mental strain of the practitioner in constantly reassuring an anxious patient and is also intended to reduce the physical

strain of the practitioner in restricting the movements of a struggling patient while carrying out the procedure.

Techniques: There are many techniques available for sedation. Principally they are non titrable techniques, titrable techniques and a combination of the two. **Non titrable techniques** are many and consists of oral, nasal, rectal, subcutaneous and intramuscular sedation techniques. The problems with these techniques are that some patients are undersedated and some are oversedated. The main problem is with those who are oversedated. There is no way of decreasing the sedation. They take time to regain consciousness thereby delaying the surgery. They may take a long time to recover street fitness. Thus the time for discharge will be delayed.

The **titrable techniques** of sedation are inhalational sedation and intravenous sedation. **Inhalational sedation** is commonly carried out with nitrous oxide and oxygen. Isoflurane and enflurane have also been used. The disadvantages are the pollution they cause needing scavenging which is costly and with nitrous oxide the problem of diffusion into cavities giving rise to diffusion hypoxia at the end of sedation.

Intravenous sedation techniques can be broadly categorised into three techniques. Sedationist controlled intravenous sedation, patient controlled intravenous sedation and computer controlled intravenous sedation.

Sedationist controlled intravenous techniques are either monovalent techniques or polyvalent techniques. One must remember when performing intravenous sedation in children that the therapeutic margin between sedation and anaesthesia in children is narrow. In children intravenous sedation should be carried out only if essential, by well trained sedationists preferably anaesthesiologists.

Monovalent techniques are mainly carried out with benzodiazepines. The commonest is midazolam and next comes diazepam. Flunitrazepam and lorazepam have also been used. Problem with them is that they cause prolonged sedation. Propofol is becoming popular for sedation among anaesthesiologists and ketamine is also being used. Midazolam and propofol are the commonest agents used. Midazolam is water soluble and hence does

not cause pain during injection and the difference in the doses needed for sedation and anaesthesia is much greater than with propofol. Further need for oxygen supplements during sedation or infusions to boost the circulation in young and healthy are usually unnecessary with midazolam. The advantage of propofol is the quicker recovery and less postoperative amnesia. Propofol is NOT recommended to be administered by surgeons or dental practitioners for sedation.

The commonest polyvalent techniques are a combination of benzodiazepines and opioids. The commonest opioids used are pethidine, fentanyl, alfentanil, remifentanyl, pentazocine and nalbuphine. The problems with opioids are respiratory depression and bradycardia. Problems with polyvalent techniques are that their actions may be additive or synergistic as reported with fentanyl and alfentanil. The other problem is the maximum action of the different drugs may occur at different times. This is true both for sedation and for the side effects.

Antagonists: In a place where sedation is carried out with benzodiazepines, flumazenil must be stored with the resuscitation drugs in order to treat accidental overdose, iatrogenic overdose and paradoxical reactions. If narcotic analgesics are being used naloxone should also be available with the resuscitation drugs in order to treat overdose with narcotics.

Patient Controlled Sedation: Degree of sedation that is needed to tolerate an operation analogous to the dose of analgesia necessary for pain control is best known to the patient him/herself. For control of pain, the new technique is patient controlled analgesia; similarly for sedation, the new technique is patient controlled sedation. It has been carried out with both midazolam and propofol with monitoring of the vital signs of the patient.

Patient Maintained (Computer Controlled) Sedation: In this technique when the age and weight of the patient and the target blood concentration of propofol that should be achieved are fed into the computer according to a pre set pharmacokinetic model the computer injects propofol into the patient to reach a predicted blood level. If the

patient requires more drug the patient presses a button which triggers the computer to instruct the infusion system to deliver a higher dose of the drug.

Mortality: Two deaths have been reported in dental sedation in UK in 10 years. One has been due to a mistaken ampoule of adrenaline for atropine. Another 13 mg of midazolam injected into a hypothyroid patient. In USA 15 deaths have been reported in 15 years in dental office sedation in states from whom these reports could be obtained. Over 50% has been in children. The major cause was polypharmacy. In 62% patients there had been no monitoring other than observation.

Guidelines: Various professional bodies have set up guidelines for sedation. In UK Poswillo report in 1990 gives the new guidelines for dentists.. The decreased

mortality in UK is partly due to the strict guidelines set by the professional bodies.

Training: Dental practitioners conducting intravenous sedation must have undergone training in this field as intravenous sedation is an invasive technique. In Hong Kong there are training courses. In the first part the dental practitioners are trained in basic cardiopulmonary resuscitation and are given lectures on medical emergencies. Then they are given lectures on sedation and have to perform 20 cases under supervision after which they sit for an examination and are given a certificate.

Future: In the future use of intravenous sedation will become more popular and safer with short acting drugs, specific antagonists, good monitoring techniques and strict guidelines.